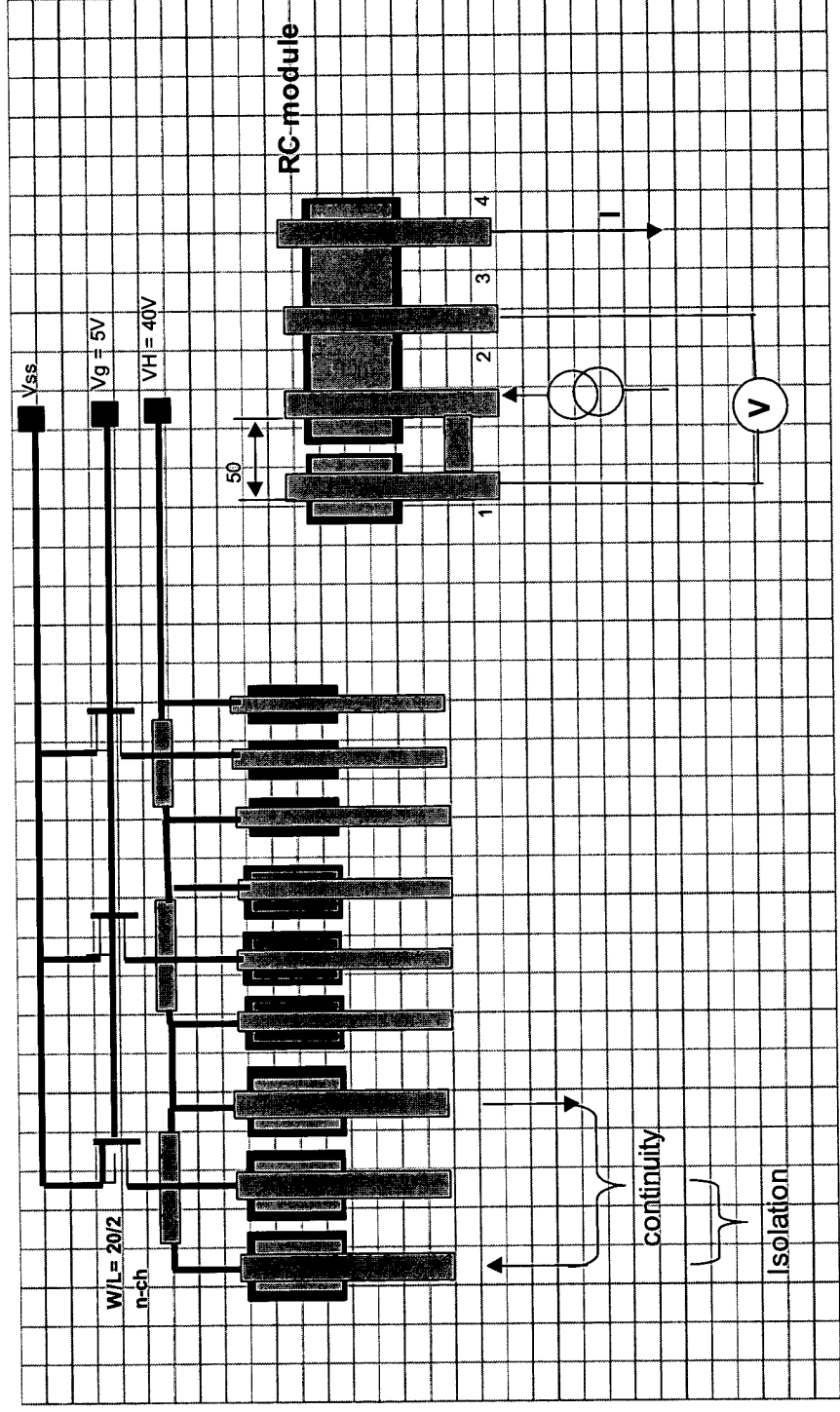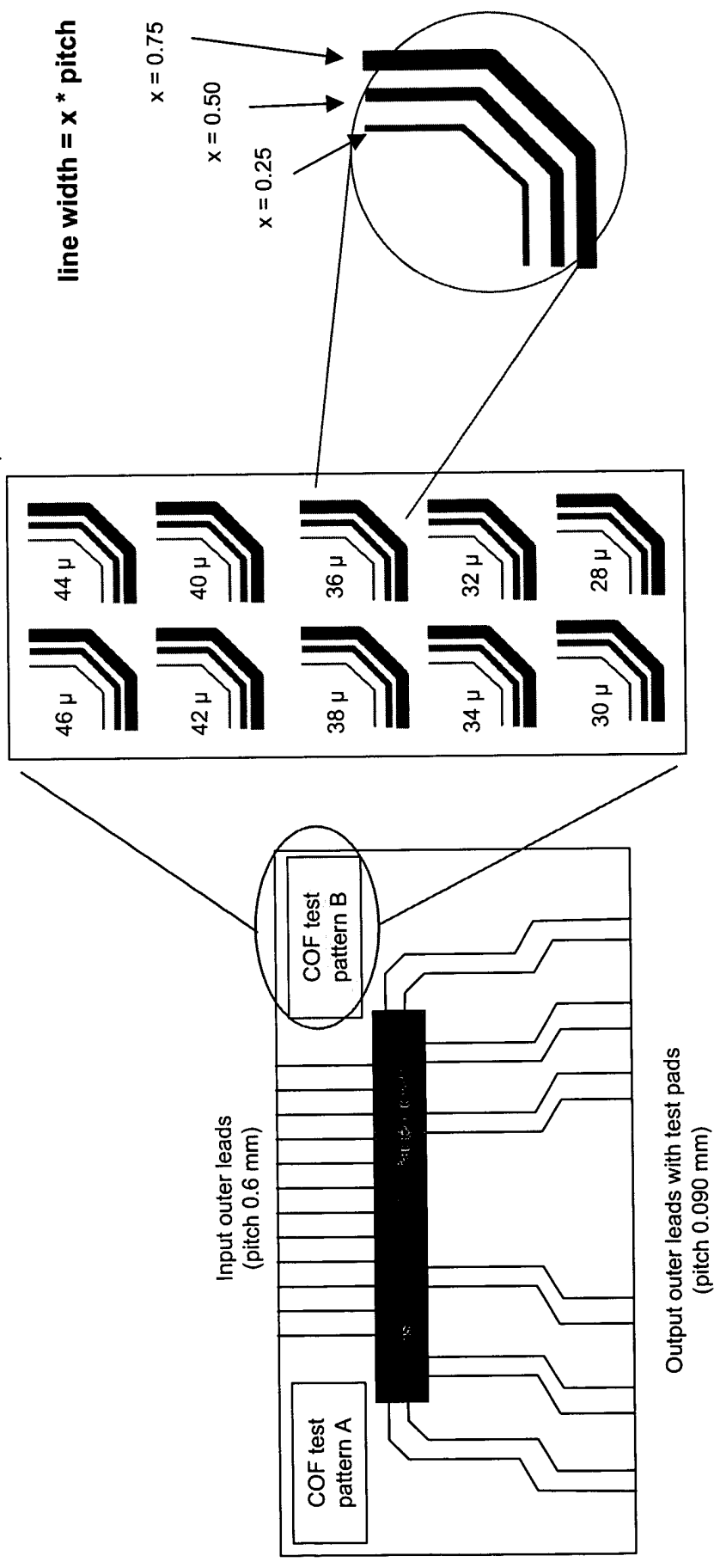# Construction of test IC (2)

- Test structures for isolation and continuity measurements
- Au and Al bumps
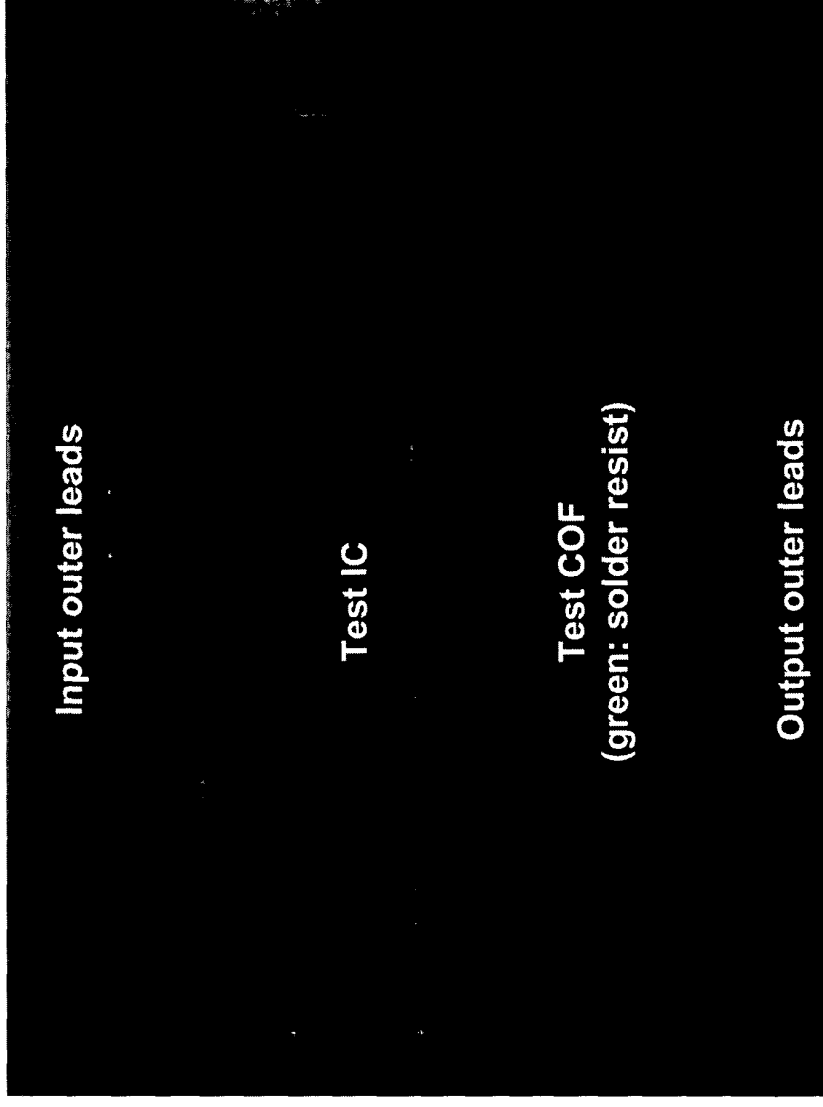
PHILIPS

Construction of test COF

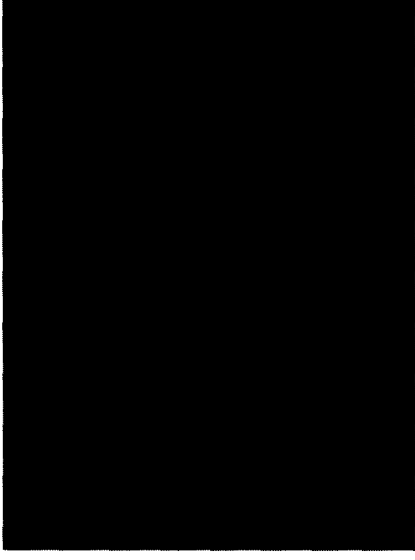- Layout similar to existing COF products
- Additional test structures

line width = x * pitch

x = 0.75

x = 0.50

x = 0.25

44 μ

40 μ

36 μ

32 μ

28 μ

46 μ

42 μ

38 μ

34 μ

30 μ

COF test pattern B

Input outer leads
(pitch 0.6 mm)

Output outer leads with test pads
(pitch 0.090 mm)

COF test pattern A

PSZ Technology Center, Hamit Duran, 10.10.2002

23

PHILIPS

Construction Analysis of test COF (1)

Overview (look through the tape onto die)

Input outer leads

Test IC

Test COF
(green: solder resist)

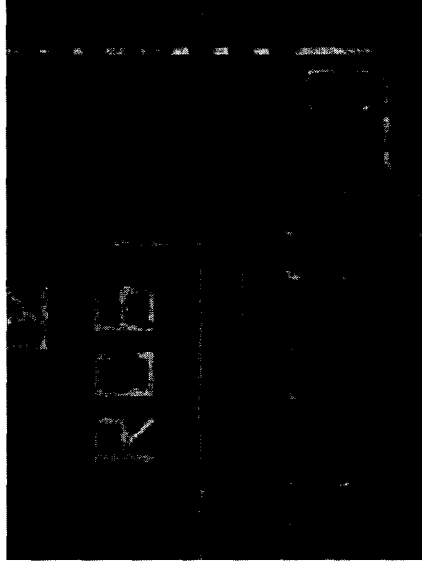Output outer leads

PSZ Technology Center, Hamit Duran, 10.10.2002

PHILIPS

Construction Analysis of test COF (2)

32 μm test structure

30 μm test structure
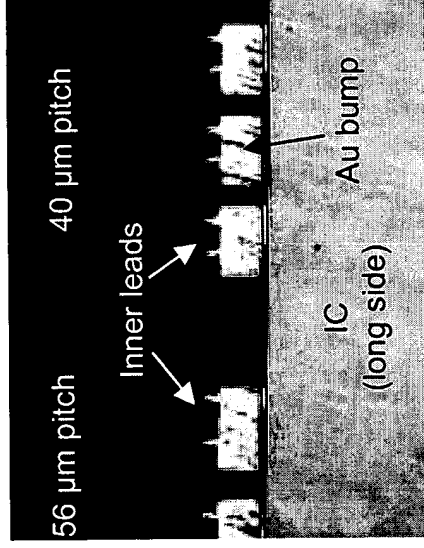
ILB at top left corner

ILB at bottom right corner

25

PHILIPS

Construction Analysis of test COF (3)

ILB cross-sections (short side)

Underfill

Tape

IC
(short side)

Tracks on COF tape (40 µm pitch)
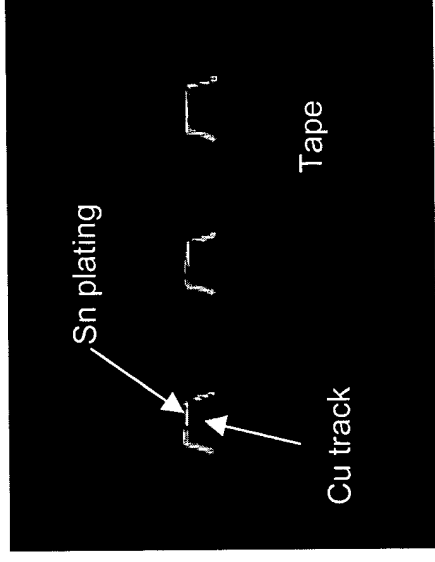
Sn plating

Tape

Cu track

ILB cross-section (long side)

56 µm pitch

40 µm pitch

Inner leads

Au bump

IC
(long side)

PSZ Technology Center, Hamit Duran, 10.10.2002

Yield analysis of test COF (1)

Test COF yield analysis for specific pitch

PHILIPS

Yield analysis of test COF (2)

Test COF defect density for specific pitch
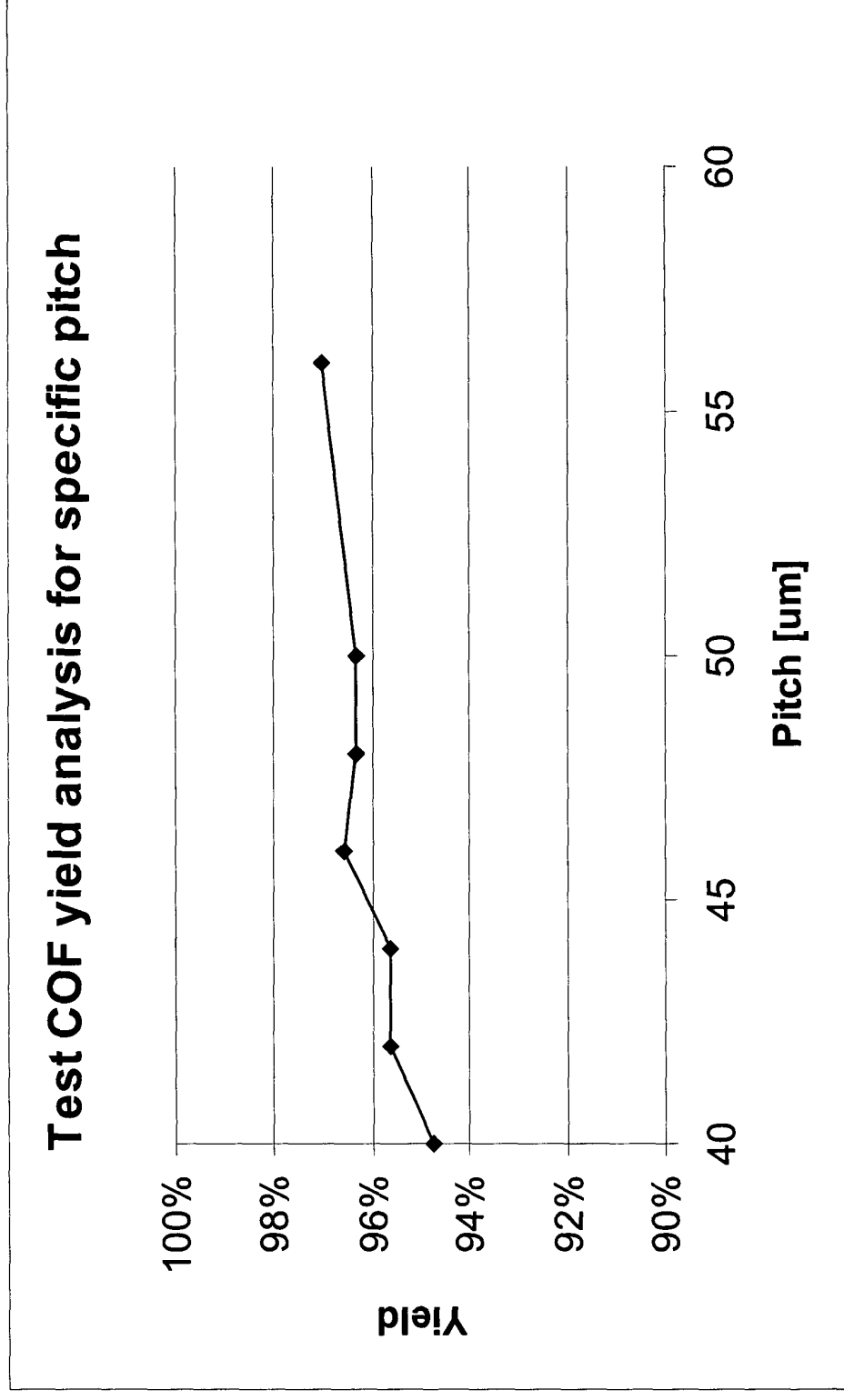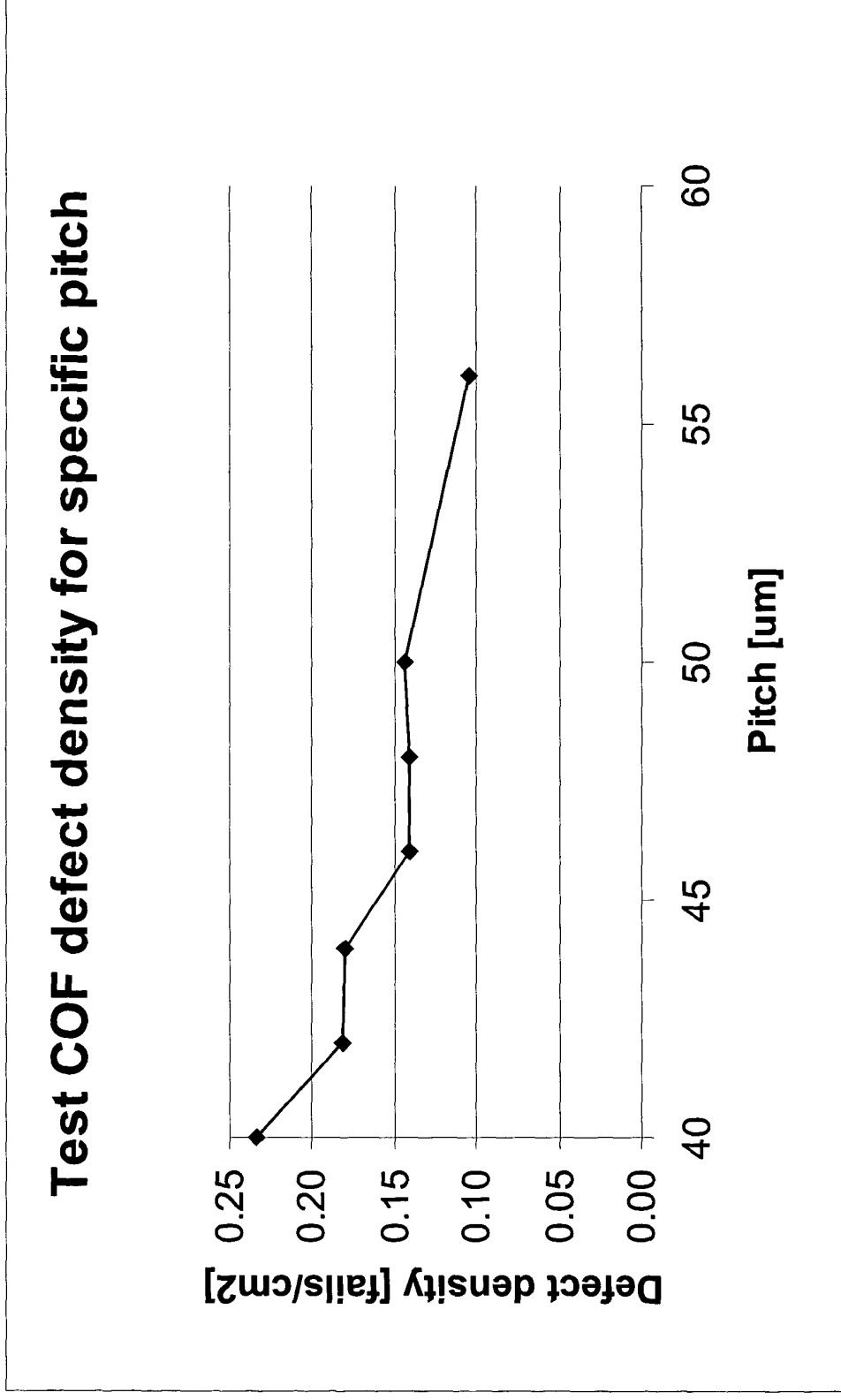
Preliminary reliability test results (1)

- Most of the standard reliability tests are pass:

  – Temperature cycling (TMCL):
    -55°C, 125°C, 200 cycles

  – Unbiased highly accelerated stress test (UHST):
    125°C, 85% rH, 96 h

 – High temperature storage life (HTSL): 125°C, 1008 h

BUT:

  – Temperature humidity bias (THB), 85°C, 85% rH, 1008 h is fail
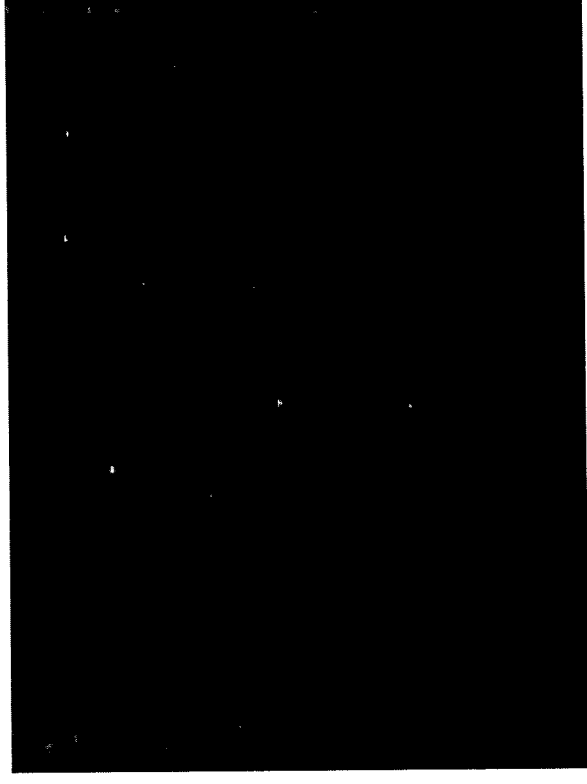   for 25 V and 40 V bias.

Preliminary reliability test results (2)

- A first investigation shows that corrosion and migration occurred between the lines where with a voltage difference was applied.
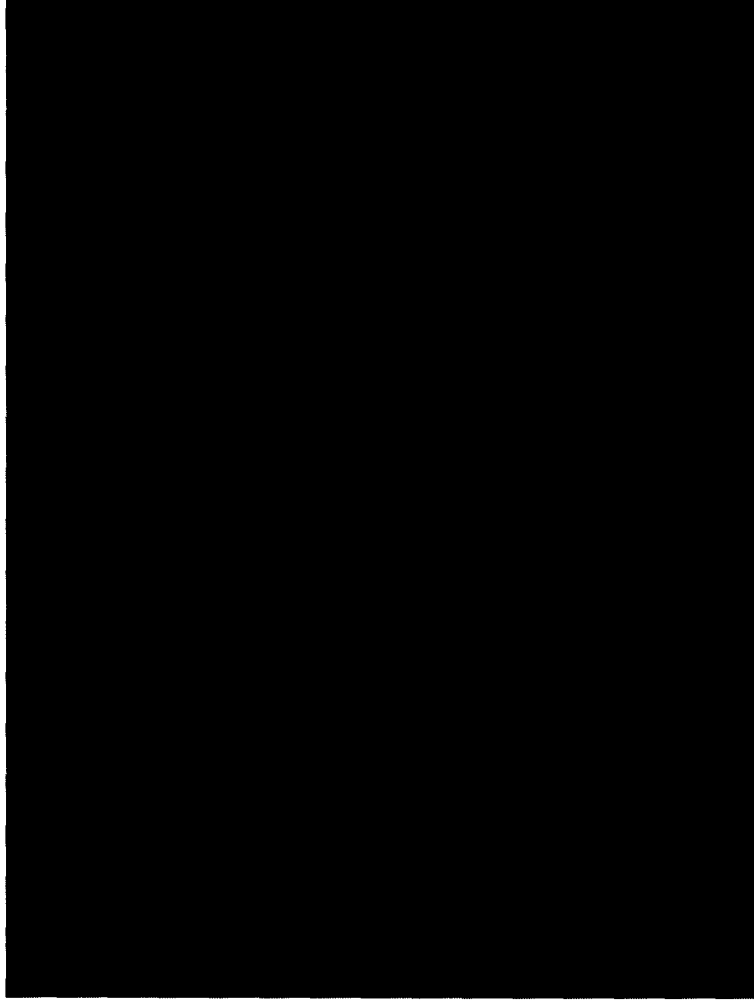
Corroded test pad

Corroded on biased tracks

40 V

0 V

40 V

40 V

PSZ Technology Center, Hamit Duran, 10.10.2002
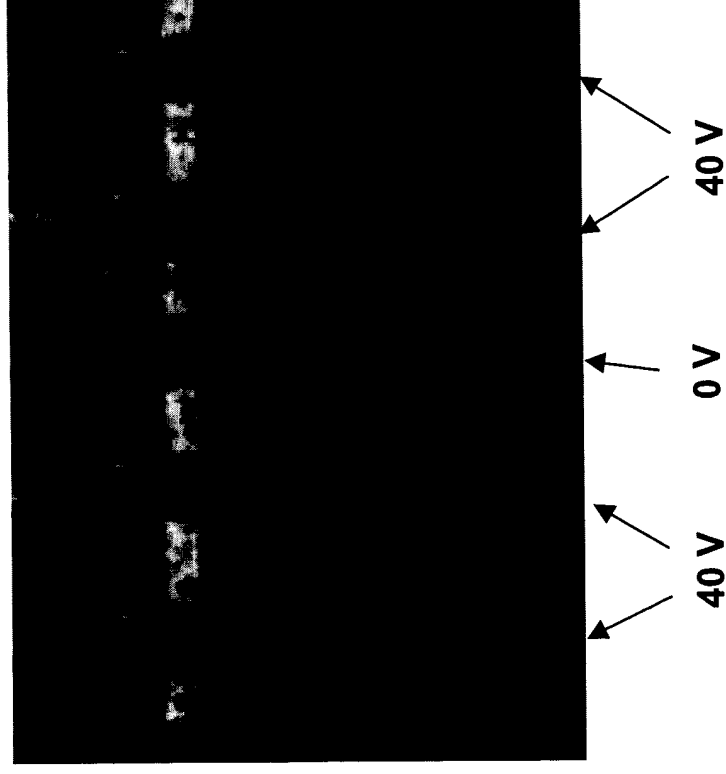
PHILIPS

Preliminary reliability test results (3)

- Further investigations are ongoing at Philips and at subcontractors.

"Tree-like" migration dendrites

Conclusions

COF is an interesting alternative for future display driver applications

- The new concept seems to be a viable option to qualify new assembly processes

  However, some reliability issues still need to be solved, namely the relationship between pitch and max. static bias voltage that can withstand 1008 h THB must be assessed.

PHILIPS